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FAMILY BREAK UP, DEPARTURE, AND AUTUMN MIGRATION IN EUROPE OF A FAMILY OF GREATER SPOTTED EAGLES (*AQUILA CLANGA*) AS REPORTED BY SATELLITE TELEMETRY

BERND-U. MEYBURG[1]
World Working Group on Birds of Prey, Wangenheimstr. 32, D-14193 Berlin, Germany

CHRISTIANE MEYBURG
World Working Group on Birds of Prey, 31 Avenue du Maine, F-75015 Paris, France

TADEUSZ MIZERA AND GRZEGORZ MACIOROWSKI
Agricultural University, Zoology Department, Wojska Polskiego 71C, 60-625 Poznan, Poland

JAN KOWALSKI
Gugny 2, 19-104 Trzcianne, Poland

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The transition of birds of prey to independence is difficult to study (Brown and Amadon 1968), as both old and young birds stray ever further from the nest site toward the end of the post-fledging period. We know of no study concerning a raptor species in which the departure on migration, the break up of the family, and subsequent migration have been investigated by satellite tracking. Here, we report on a case concerning Greater Spotted Eagles (*Aquila clanga*). Available information on this species is limited, but Ivanov et al. (1951) and Dementiev and Gladkov (1951) believed that Greater Spotted Eagle families departed as a unit on migration.

In the closely related Lesser Spotted Eagle (*Aquila pomarina*), both adults migrated separately, as determined by satellite telemetry (Meyburg et al. 2006). The offspring in this species, which were not tracked with satellite telemetry, normally leave before the parent birds. However, in some cases, the females leave before the young (Meyburg et al. 2006). Satellite telemetry has so far been used to track one adult Greater Spotted Eagle (Meyburg et al. 1995a).

As part of a long-term research program in northeastern Poland (Mizera et al. 2001), we are endeavoring to raise the level of knowledge, and thereby, the protection of the Greater Spotted Eagle by making use of the available technology (i.e., satellite telemetry) to investigate the species' migration and wintering habits.

METHODS

In 1996, an entire family of Greater Spotted Eagles was fitted with satellite transmitters (Platform Transmitter Terminals, PTTs) in the Biebrza river valley of northeastern Poland. The eagle nest was located in a National Park protecting the largest peatlands in Central Europe, including 15 547 ha of forests, 18 182 ha of agricultural land, and 25 494 ha of wetlands—the Biebrza marshes. More than 70 natural and semi-natural plant associations have been documented in the Biebrza valley. The most dominant forest associations include black alder (*Alnus glutinosa*), swampy birch (*Betula pubescens*), and peat coniferous forests (*Salici-Betuletum*). Frequent anthropogenic ecosystems found in the valley are pastures, cultivated grounds and urbanized areas. One of the greatest threats to the park is human modified drainage patterns, which causes the invasion of marshes by shrubs and trees. Active conservation measures have been applied to stop further succession and maintain more natural intermediate successional stages. A broad public awareness campaign is in place to encourage the adoption of organic farming, as 45% of the park is privately owned. The eagle nest was built in dense humid alder (*Alnus glutinosa*) and birch (*Betula* spp.) forest.

We used the dho gaza method (Hamerstrom 1963, Clark 1981, Bloom 1987) with a Eurasian Eagle Owl (*Bubo bubo*) to trap the adults. By this method, the eagles "attacked" the live eagle owl, tethered to a perch and got entangled in the dho gaza net. We used transmitters supplied by Microwave Telemetry, Inc. (Columbia, MD U.S.A.) with a mass of 60 g. They were fitted as backpacks, using Teflon ribbon (Bally Ribbon Mills, Bally, PA U.S.A.) to attach them to the bird. The young fledgling eagle was equipped with a battery-powered transmitter with a mass of 60 g and a temperature sensor. To ensure as long a life as possible, this radio was programmed to operate only at intervals of 4 d and then for only 10 hr. The adult birds were fitted with solar-powered PTTs These were programmed to be in continuous operation, provided the level of light was sufficient to generate power for the transmitter.

All location data were analyzed individually and entered into databases. We used the computer program

[1] Email address: wwgbp@aol.com

Mapit (Allison 1997) to plot locations, which were provided by Service Argos, Inc. (Toulouse, France), measure distances between locations, and trace the migration routes. This program is an integrated global mapping and digital display system, which computes the great-circle distance between one point and another, while dynamically displaying both great-circle and constant-compass-bearing (rhumb) lines. Great-circle distances are physically the shortest distances on a globe.

RESULTS

Three eagles in the family broke up when leaving the breeding territory. The female was the first to depart (19 September 1996), at least 2 or 3 d before her young. The male was the last to leave (26 September 1996), 1 wk after the female. Whereas the adults headed straight for the Bosphorus (Fig. 1), the 1687 km covered by the young bird terminated in Albania, where this eagle apparently perished at the end of October. The young probably left on 21 or 22 September 1996, and the male was present on 23 September, but only made minimal migration progress by midday on 26 September 1996 (Table 1). Due to the programming of its transmitter (operation of 4 d) the progress of the young could not be determined as accurately as that of the two adults. The date of departure of the young eagle was assessed from the first locations away from the nest, providing an average estimate of speed and distance from the breeding territory during the first stages of its migration (Table 1, 2). On average, this eagle flew only 57 km per day. This young eagle may have covered the first 257 km up to the first location away from the nest in more than 4 or 5 d, and thus, have left the breeding area before 21 or 22 September.

The young bird set off from the breeding territory in a southwesterly direction (Fig. 1). The eagle remained in Poland until at least 4 October, while the female and male were located in the country for the last time on 19 and 26 September, respectively. The female reached the Bosphorus on 14 October and the male on 22 October. The young bird apparently met its death in southern Albania, ca. 70 km south of Tirana and 13 km north of Ballesh. All the data from its transmitter (temperature and no change of location) after 26 October indicate mortality. The transmitter was transmitting signals until 13 July 1997. However, it is also possible, but much less likely, that the eagle lost or removed the transmitter.

DISCUSSION

In birds of prey, the transition to independence is difficult to study as toward the end of the post-fledging period, both old and young birds stray ever further from the nest site. Direct observation does not account adequately for local movements of raptors as they begin the departure process. Nevertheless, a number of studies concerning eagles and other raptors (e.g., Alonso et al. 1987, Morvan and Dobchies 1990, Bahat 1992, Bustamante 1995, Real et al. 1998, Rafanomezantsoa 2000) have been published during recent years.

Table 1. The departure of the Greater Spotted Eagle family from the nest site in 1996 was determined by satellite telemetry.

	ID-NUMBER	DATE AND TIME (GMT) OF LAST LOCATION AT NEST	DATE AND TIME (GMT) OF FIRST MIGRATION LOCATION	DISTANCE FROM NEST SITE TO FIRST MIGRATION LOCATION	DATE OF DEPARTURE	REMARKS
Male	16864	23 Sept at 0117 H	26 Sept at 1037 H	46 km	Probably 26 Sept (AM)	This bird could have left in the morning of 23 Sept, as midday (local time) of 26 Sept it was 46 km away from the nest site. However, based on its mean migration speed, it most likely left the morning of 26 Sept.
Female	19628	18 Sept at 1817 H	20 Sept at 0047 H	193 km	19 Sept	The bird could not have left on 18 Sept.
Offspring (male)	19626	17 Sept at 1034 H	26 Sept at 0044 H	257 km	Probably on 21 or 22 Sept	This eagle could have left the breeding area as early as 17 Sept, but this is unlikely given its mean daily distances covered.

Figure 1. The autumn migration of the three Greater Spotted Eagles in Europe determined by satellite telemetry in 1996; dates of arrival at selected points en route are indicated.

Table 2. The outward migration of the juvenile Greater Spotted Eagle (see Fig. 1) 1996 was determined by satellite telemetry.

BEGINNING AND END OF EACH STAGE[a]	LENGTH OF THE DIFFERENT STAGES IN km	DURATION OF EACH STAGE (days)	MEAN LENGTH OF DAILY FLIGHT DISTANCES	COUNTRIES TRANSVERSED
ca 21/22 Sept 26 Sept: 0044 H	257 km	?	?	Poland
26 Sept: 0044 H 30 Sept: 1134 H	Roosting	4.5	—	Poland
30 Sept: 1134 H 4 Oct: 1534 H	242 km	4.5	54 km/day	Poland
4 Oct: 1720 H 9 Oct: 0005 H	76 km	4	19 km/day	Poland and Slovakia
9 Oct: 0547 H 13 Oct: 0600 H	329 km	4	82 km/day	Slovakia and Hungary
13 Oct: 0600 H 17 Oct: 1327 H	202 km	4.5	45 km/day	Hungary and Croatia
17 Oct: 1738 H 22 Oct: 0109 H	361 km	4	90 km/day	Bosnia - Herzegovina
22 Oct: 0109 H 26 Oct: 0619 H	220 km	4	55 km/day	Montenegro and Albania

[a] Each migration stage was 4 d, based on the duty cycle of the satellite transmitter. Location data provided by Argos Service, Inc (Toulouse, France).

Dementiev and Gladkov (1951) and Ivanov et al. (1951) believed that Greater Spotted Eagle families departed together on migration. We know of no study in the literature on this species, or any other raptor, in which the dates of departure on migration, the break up of the family, and their combined or separate migrations have been investigated by satellite telemetry. The family of Greater Spotted Eagles studied here clearly broke up when leaving the breeding territory.

We also have studied a pair of the closely-related Lesser Spotted Eagle using this method over several years. The members of this pair migrated separately in 1997–98 and 1998–99 and overwintered ca. 1000 km apart both years in southern Africa (Meyburg et al. 2006). However, in this case, the offspring were not tracked.

REGISTRO DE LA RUPTURA FAMILIA, PARTIDA Y MIGRACIÓN DE OTOÑO DE UNA FAMILIA DE AQUILAS MOTEADAS (*AQUILA CLANGA*) EN EUROPA USANDO TELEMETRÍA SATELITAL

RESUMEN.—Ambos adultos y el polluelo de una famila de *Aquila clanga* fueron estudiados mediante telemetría satelital en el noreste de Polonia para determinar la fecha de inicio de su migración, la disolución de la familia y sus patrones de migración combinados e independientes. La familia se disolvió al abandonar el territorio de cría. La hembra fue la primera en partir, el inmaduro lo hizo alrededor dos o tres días más tarde y el macho partió una semana después de la hembra. Los adultos se dirigieron directo al Bósforo. El inmaduro recorrió 1687 km hasta Albania, donde aparentemente murió a fines de octubre.

[Traducción del autor]

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SEASONAL PATTERNS OF COMMON BUZZARD (*BUTEO BUTEO*) RELATIVE ABUNDANCE AND BEHAVIOR IN POLLINO NATIONAL PARK, ITALY

MASSIMO PANDOLFI, ALESSANDRO TANFERNA, AND GIORGIA GAIBANI[1]
Istituto di Zoologia, Università di Urbino, via Oddi 21, 61029 Urbino, Italy

KEY WORDS: *Common Buzzard*; Buteo buteo; *relative abundance*; *roadside surveys.*

Nest-site selection and habitat use have been described in the Common Buzzard (*Buteo buteo*) by several authors (e.g., Penteriani and Faivre 1997, Krüger 2002, Lõhmus 2003, Bustamante and Seoane 2004, Sergio et al. 2005), but few studies have documented annual variations in the abundance and habitat associations of this species (Meunier et al. 2000).

We conducted monthly roadside surveys of Common Buzzards in a mountainous area of southern Italy. Although roadside surveys have well-known limitations (e.g., Andersen et al. 1985, Fuller and Mosher 1987, Millsap and LeFranc 1988, Viñuela 1997), they remain a useful technique for monitoring local abundance and distribution of raptors (Fuller and Mosher 1987, Ellis et al. 1990). Because roadside surveys are easy to conduct, they can be carried out at frequent intervals. Here, we present results from monthly roadside surveys of Common Buzzards. Using these data, we examine habitat associations, describe seasonal patterns of Common Buzzard behavior and abundance and, in particular, discuss the effectiveness of roadside surveys to monitor changes in abundance.

METHODS

The Common Buzzard (hereafter buzzard) surveys were conducted from October 2000–September 2001 in Pollino

[1] Present address and corresponding author: Museo di Storia Naturale, Dipartimento di Biologia Evolutiva e Funzionale, Università di Parma, Via Farini 90, 43100 Parma, Italy; e-mail address: gaibani@biol.unipr.it